CLAIMS

1. A method for fabricating a semiconductor device characterized by comprising:

a resin sealing step of loading a substrate on which semiconductor elements having protruding electrodes are formed, and supplying a sealing resin to positions of the protruding electrodes so as to form a resin layer which seals the protruding electrodes and the substrate;

a protruding electrode exposing step of exposing at least ends of the protruding electrodes from the resin layer; and

a separating step of cutting the substrate together with the resin layer so that the semiconductor elements are separated from each other.

2. The method for fabricating the semiconductor device as claimed in claim 1, characterized in that the sealing resin used in the resin sealing step has an amount which causes the resin layer to have a height approximately equal to that of the protruding electrodes.

3. The method for fabricating the semiconductor device as claimed in claim 1 or 2, characterized in that the resin sealing step disposes a film between the protruding electrodes and the mold, which thus contacts the sealing resin through the film.

4. The method for fabricating the semiconductor device as claimed in any of claims 1 to 3, characterized in that:

the mold used in the resin sealing step comprises an upper mold which can be elevated, and a lower mold having a first lower mold half body which

in the film when the resin layer is formed by using the mold; and

the film is detached from the resin layer in the protruding electrode exposing step so that the ends of the protruding electrodes can be exposed from the resin layer.

13. A mold for fabricating a semiconductor device characterized by comprising:

an upper mold which can be elevated; and

a lower mold having a first lower mold half body which is kept stationary and a second lower mold half body which is provided so as to surround the first lower mold half body and can be elevated with respect to the first lower mold half body,

a cavity being defined by a cooperation of the upper and lower molds and being filled with resin.

14. The mold for fabricating the semiconductor device as claimed in claim 13, characterized in that there is provided an excess resin removing mechanism is provided in the mold used in the resin sealing step,

wherein the excess resin removing mechanism removes excess resin and controls a pressure applied to the sealing resin in the mold.

15. The mold for fabricating the semiconductor device as claimed in claim 13 or 14, characterized in that there is provided an attachment/detachment mechanism which attaches the substrate to a position of the first lower mold half body and detaches the substrate therefrom.

16. The mold for fabricating the semiconductor device as claimed in claim 15, characterized in that the attachment/detachment

mechanism comprises:

a porous member arranged in the position of the first lower mold half body onto which the substrate is loaded; and

an intake/exhaust device performing a gas suction and supply process for the porous member.

17. The mold for fabricating the semiconductor device as claimed in any of claims 13 through 16, characterized in that an area enclosed by the second lower mold half body is wider than an area of an upper portion of the first lower mold half body in a state in which the cavity is formed.

18. A semiconductor device characterized by comprising:

a semiconductor element having a surface on which protruding electrodes are directly formed; and

a resin layer which is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof.

19. The semiconductor device as claimed in claim 18, characterized in that there is provided a heat radiating member provided on a back surface of the semiconductor element opposite to the surface thereof on which the protruding electrodes are provided.

20. The method for fabricating the semiconductor device as claimed in any of claims 1 to 12, characterized in that the sealing resin used in the resin sealing step comprises a plurality of sealing resins having different characteristics.

21. The method for fabricating the semiconductor device as claimed in claim 9 or 10,

characterized in that there is provided a reinforcement plate to which the sealing resin is provided beforehand in the resin sealing step.

22. The method for fabricating the semiconductor device as claimed in claim 21, characterized in that:

a frame extending towards the substrate in a state in which the reinforcement plate is loaded onto the mold is formed to define a recess portion; and

the resin layer is formed on the substrate by using, as a cavity for resin sealing, the recess portion in the resin sealing step.

23. The method for fabricating the semiconductor device as claimed in any of claims 1 to 12, characterized in that a second resin layer is formed so as to cover a back surface of the substrate after or at the same time as the first, resin layer is formed, in the resin sealing step, on the surface of the substrate on which the protruding electrodes are arranged.

24. The method for fabricating the semiconductor device as claimed in any of claims 3 to 10, characterized in that:

the film used in the resin sealing step has projections located in positions corresponding to those of the protruding electrodes; and

the resin layer is formed in a state in which the projections are pressed against the protruding electrodes.

25. The method for fabricating the semiconductor device as claimed in any of claims 1 to 12 and 20 to 24, characterized in that:

an external connection protruding electrode

32. The method for fabricating the semiconductor device as claimed in any of claims 1 to 12 and 20 to 31, characterized in that positioning grooves are formed on a back surface of the resin layer or the substrate after the resin sealing step is executed and before the separating step is executed.

33. The method for fabricating the semiconductor device as claimed in claim 32, characterized in that the positioning grooves can be formed by subjecting the back surface to half scribing.

34. The method for fabricating the semiconductor device as claimed in any of claims 3 to 12 and 20 to 29, characterized in that:

the film used in the resin sealing step has projection or recess portions located in positions in which the film is not interfered with the projecting electrodes; and

recess or projection portions formed on the resin layer by the projection or recess portions are used for positioning after the resin sealing step is completed.

35. The method for fabricating the semiconductor device as claimed in any of claims 1 to 12 and 20 to 29, characterized in that the sealing resin is processed in positions in which positioning protruding electrodes are formed in order to discriminate the protruding electrodes and the positioning protruding electrodes from each other.

36. A semiconductor device characterized by comprising:

a semiconductor element having a surface on which external connection electrodes are provided

which are to be electrically connected to external terminals; and

a resin layer provided on the surface of the semiconductor element so as to cover the external connection electrodes,

wherein the external connection electrodes are laterally exposed at an interface between the semiconductor element and the resin layer.

37. The method for mounting the semiconductor device as claimed in claim 36, characterized in that the semiconductor device is mounted on a mounting board so as to vertically stand thereon.

38. The method for mounting the semiconductor device as claimed in claim 37, characterized in that a plurality of semiconductor elements are arranged side by side so that adjacent ones of the semiconductor elements are bonded by an adhesive.

39. The method for mounting the semiconductor device as claimed in claim 37, characterized in that a plurality of semiconductor elements are arranged side by side so as to vertically stand by supporting members.

40. The method for mounting the semiconductor device as claimed in any of claims 18, 19 and 36, characterized in that the semiconductor device is mounted on a mounting board through an interposer.

41. The semiconductor device as claimed in claim 18 or 17, characterized in that the resin layer comprises a plurality of resin layers having different

semiconductor device as claimed in claim 44, characterized in that a frame having a cavity portion in which the semiconductor element is accommodated is provided when the wiring board is formed.

46. The method for fabricating the semiconductor device as claimed in claim 44 or 45, characterized in that a film having a detachability with respect to the sealing resin is provided in a position of the mold facing the wiring board, so that the mold contacts the sealing resin through the film.

47. The method for fabricating the semiconductor device as claimed in claim 44 or 45, characterized in that a plate member having a detachability with respect to the sealing resin is provided in a position of the mold facing the wiring board, so that the mold contacts the sealing resin through the plate member.

48. The method for fabricating the semiconductor device as claimed in claim 47, characterized in that the plate member is formed of a substance having a heat radiating performance.

49. The method for fabricating the semiconductor device as claimed in any of claims 44 to 48, characterized in that there is provided an excess resin removing mechanism is provided in the mold used in the resin sealing step,

wherein the excess resin removing mechanism removes excess resin and controls a pressure applied to the sealing resin in the mold.

50. The method for fabricating the semiconductor device as claimed in any of claims 44 to 49, characterized in that:

extending portions are formed to the wiring board so that the extending portions laterally extend from a position in which the semiconductor element is placed; and

a bending step of bending the extending portions is executed after the resin sealing step is completed and before the protruding electrode forming step is executed.

51. The method for fabricating the semiconductor device as claimed in any of claims 44 to 49, characterized in that:

extending portions are formed to the wiring board so that the extending portions laterally extend from a position in which the semiconductor element is placed;

a bending step of bending the extending portions is carried out before the resin sealing step is executed; and

the resin sealing step and the protruding electrode forming step are carried out after the bending step is executed.

52. The method for fabricating the semiconductor device as claimed in claim 50 or 51, characterized in that:

connection electrodes to be connected to the semiconductor element are formed to ends of the extending portions; and

an element connecting step of connecting the semiconductor element and the connection electrodes is executed after the bending step is carried out.

53. The method for fabricating the semiconductor device as claimed in claim 51, characterized in that the connection electrodes are arranged in an interdigital formation, and have curved

semiconductor element or elements, the electrode plate having portions which are exposed from side surfaces of the sealing resin and function as external connection electrodes.

58. The semiconductor device as claimed in claim 57, characterized in that the semiconductor element or elements are connected to the electrode plate in a flip-chip bonding formation.

59. The semiconductor device as claimed in claim 57 or 58, characterized in that the electrode plate is exposed from a bottom surface of the sealing resin in addition to the side surfaces thereof, so that portions of the electrode plates exposed from the bottom surface function as external connection terminals.

60. The semiconductor device as claimed in claim 57 or 58, characterized in that protruding terminals are provided to the electrode plate, and are exposed from a bottom surface of the sealing resin, so that the protruding terminals function as external connection terminals.

61. The semiconductor device as claimed in claim 60, characterized in that the protruding terminals are portions of the electrode plate defined by plastic deformation.

62. The semiconductor device as claimed in claim 60, characterized in that the protruding terminals are the protruding electrodes arranged to the electrode plate.

63. The semiconductor device as claimed in any of claims 57 to 62, characterized in that the

semiconductor element or elements are partially exposed from the sealing resin.

64. The semiconductor device as claimed in any of claims 57 to 63, characterized in that there is provided a heat radiating member in a position close to the semiconductor element or elements.

65. A method for fabricating a semiconductor device characterized by comprising:

an electrode plate forming step of forming a pattern on a metallic base so that an electrode plate is formed;

a chip mounting step of mounting semiconductor elements on the electrode plate and electrically connecting the semiconductor elements thereto;

a sealing resin forming step of forming a sealing resin which seals the semiconductor elements and the electrode plate; and

a cutting step of cutting the sealing resin and the electrode plate at boundaries between adjacent ones of the semiconductor elements so that the semiconductor devices are separated from each other.

66. The method for fabricating the semiconductor device as claimed in claim 65, characterized in that the pattern is formed in the electrode plate forming step by etching or press processing.

67. The method for fabricating the semiconductor device as claimed in claim 65 or 66, characterized in that the semiconductor elements are mounted, in the chip mounting step, on the electrode plate in a flip-chip bonding formation.

bumps arranged to the protruding terminals for forming the external connection terminals,

the semiconductor device being connected to the mounting board through the bumps.

72. A mounting arrangement for mounting the semiconductor device as claimed in any of claims 59 to 64 on a mounting board, characterized by comprising:

a mounting member including connection pins that are flexibly deformable and are located in positions corresponding to those of the external connection terminals, and a positioning member positioning the connection pins,

upper ends of the connection pins being connected to the external connection terminals of the semiconductor device, and lower ends thereof being connected to the mounting board.

73. A semiconductor device characterized by comprising:

a semiconductor device main body having a semiconductor element having a surface on which protruding electrodes are directly formed, and a resin layer which is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof;

an interposer to which the semiconductor device main body is attached, a wiring pattern to which the semiconductor device main body is connected being formed on a base member of the interposer;

an anisotropic conductive film which has an adhesiveness and a conductivity in a pressed direction and is interposed between the semiconductor device main body and the interposer, the anisotropic conductive film fixing the semiconductor device main body to the interposer and electrically connecting them; and

interposer;

a conductive member which electrically connects the semiconductor device main body and the interposer; and

external connection terminals which are connected to the wiring pattern through holes forme in the base member and are arranged on a surface of the semiconductor device main body opposite to the surface on which the protruding electrodes are provided.

80. The semiconductor device as claimed claim 79, characterized in that the conductive memb is a conductive paste.

81. The semiconductor device as claimed claim 79, characterized in that the conductive memb comprises stud bumps.

82. The semiconductor device as claimed claim 79, characterized in that the conductive memb comprises flying leads, which are integrally formed with the wiring pattern and bypasses the adhesive s as to be connected to the protruding electrodes.

83. The semiconductor device as claimed clam 82, characterized in that connections of the protruding electrodes and the flying leads are seal by resin.

84. The semiconductor device as claimed claim 79, characterized in that the conductive membe comprises:

connection pins that are flexibly deformal and are located in positions corresponding to those the protruding electrodes; and

a positioning member positioning the